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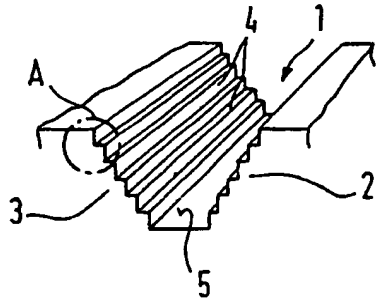
(54) A vehicle tyre.

(57) A vehicle tyre having a tread surface of ribs, blocks or pads (6) and substantially U- or V-shaped tread grooves (1) arranged therebetween wherein at least one of the two sidewalls (2, 3) of at least a part of the tread grooves (1) is provided with grip enhancing steps (4) which extend in the longitudinal groove direction and follow the sidewall contour.

FIG.1



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A VEHICLE TYRE

The invention relates to a vehicle tyre with a tread surface formed by ribs, blocks or pads and also substantially U- or V-shaped cross sectional profile tread grooves arranged therebetween.

With regard to the desired and achievable performance characteristics of a vehicle tyre, the configuration of tread surfaces of vehicle tyres is of very great significance. It is particularly difficult to meet in an optimum manner the great number of requirements, which are at least partially contradictory, and in particular to be able to take account of the specific requirements arising both in summer and in winter operation.

The problem underlying the invention is therefore to construct a vehicle tyre having a special tread configuration so that the greatest possible number of requirements including requirements which are at least partly contradictory, can be fulfilled, and in particular so that the traction and wear behaviour are improved.

According to a first aspect of the invention at least one of the two sidewalls of at least a part of the profile grooves is provided with grip steps which extend in the longitudinal groove direction and follow the sidewall contour.

Through these measures, when compared with conventionally shaped grooves having substantially smooth walls, a pronounced improvement is achieved in traction, in particular on snow. Optimisation can be achieved by specific choice of step height and step width of the individual grip steps and in particular also by choice of the enclosed angle of the steps.

A second aspect of the invention resides in providing a profiling of the road contacting pad or block surfaces, this being done in such a manner that at least part of the ribs, blocks or pads is provided with knife cuts substantially transverse to or at least at an angle to the circumferential direction of the tyre, and the tread surface region between two sequential knife cuts is of chamfered shape at least adjacent the respective trailing knife cut and leaving free the lamella edge associated with this knife cut, wherein the chamfering may be inclined against and/or with the running direction to enable the traction and braking behaviour to be specifically influenced.

In this manner the individual blocks or pads are loosened and they are provided with effective grip edges which by their adaptability to the particular structure of th road surface contribute substantially to improving the characteristics of the tyre.

Finally, a third important aspect of the invention, of particular practical significance both on its own and especially in combination with the further developments explained abov , resid s in that the blocks or pads have a surface which drops away opposite to the running direction and at least adjacent to the trailing edge, in particular in the tyre shoulder region.

With this further development it is possible to at least largely avoid the sawtooth formation present to a greater or lesser degree in conventional tyres in the shoulder region and at the same time to substantially improve the traction properties and reduce noise generation.

Further aspects will become apparent from the following description in conjunction with the attached drawings in which:

Figure 1 is a schematic illustration of a profile of a tread groove;

Figure 2 is an enlarged illustration of detail A from Figure 1;

Figure 3 is a schematic illustration of a profile for the surface of a tread block or pad;

Figure 4 is a schematic illustration of detail B of Figure 3;

Figure 5 is a schematic illustration of a variant of detail B of Figure 3;

Figure 6 is a schematic illustration of a further variant of a profile for the surface of a block or pad;

Figure 7 is a schematic illustration of a further configuration variant of a profile for a pad surface analogous to Figure 6; and

Figure 8 is a plan view for explaining a further pad edge profile according to the invention.

Figure 1 shows a cross-section through a substantially U-shaped tread groove 1 having somewhat inclined sidewalls 2,3 and a substantially planar groove bottom 5.

The sidewalls 2,3 are provided with a plurality of grip steps 4 which extend in a staircase manner from the groove bottom 5 up to the top edge of the sidewall.

As can be seen in Figure 2, showing details A of Figure 1 on a larger scale, the step height x and step width y may also be made different, the step height preferably being in the range of 0.5mm to 2mm and the step width y being in the range of 0.2mm to 1mm.

Depending on the desired grip properties, the enclosed angle α between the step faces may lie between a very low value and 90°, an angle in the range between 15° and 75° even more preferably being chosen.

This profile groove configuration is particularly advantageous on snow because in corresponding wintry road conditions it leads to a considerabl improvement in traction.

Figure 3 shows schematically a block or pad 6 having a tread surface profile which is divided or broken up by a plurality of fin knife cuts 7 and the surface of which is specially made to increase adhesion or traction.

The tread surface regions 8 each disposed between two knife cuts 7 following each other in the tyre running direction L have the form of surfaces rising in the running direction L so that the entire surface of the particular block or pad 6 represents a stepped surface having projecting lamella edges 9 extending parallel to each other. A block or pad surface constructed in this manner has significantly improved traction characteristics. The last sub-portion of the respective block or pad 6 in the running direction need not be made chamfered on the tread surface side.

Figure 4 shows details B of Figure 3. The angle β is indicated which the surface of a subblock forms with the horizontal and said angle β lies preferably in the range of 15° to 60°. The height x of the projecting lamella edge lies correspondingly in the range from 0.2 to 2mm.

In Figure 5 a variant of the embodiment according to Figure 4 is illustrated which shows that the chamfer necessary to form the lamella edges 9 need not extend over the entire width of the subblock but that alternatively it is possible to provide a steeper chamfer extending at an angle of 30 to 60° only in the region adjacent the lamella edge 9.

The inclined surfaces provided to form the lamella edges 9 may be made, as illustrated, substantially planar but it is alternatively possible to provide curved surfaces, provided that pronounced depression results in the region of the transition from one subblock to the other subblock, said depression allowing the following subblock to act in the form of a lamella edge 9.

Figure 6 shows a pad 6 with a curved surface between the leading pad edge 10 in the running direction L and the trailing pad edge 11.

Preferably, the leading edge 10 is formed as a spoiler-like protuberance 14 which after a corresponding downward slope merges into a slightly rising centre regions surface 13 which in turn continues in the region of the tralling edge 11 in a downwardly sloping surface 12. This thus results in a surface which has in cross-section the shape of a greatly elongated S.

By means of such shaping it is possible to effectively counteract the occurrence of a troublesome sawtooth formation in the tyre shoulder region, and also to counteract undesirable noise formation.

Instead of the S-shaped configuration shown in Figure 6 the surface form may also be implemented by means of substantially flatter surfaces, kinks then resulting at the transitions from the spoiler 14 and centre surface 13 or end surface 12 respectively.

Figure 7 shows a variant of th pad configuration of Figure 6. This pad surface consists of a surface 13 rising slightly oppositely to the running direction and a surface 12 which slopes downwardly to a greater extent compared therewith, i.e. the angle $\gamma 1$ is appreciably smaller than the angle $\gamma 2$.

This configuration gives an approximation to a wing shape, and this can be still further improved if the transition region between the two differently inclined surfaces 12, 13 is made rounded. This variant is also particularly favourable as regards the desired noise reduction.

Figure 8 shows a block or pad shape in the form of a plan view of a section of the running surface and it can be seen that the side surfaces of the blocks or pads 6 are provided with semicircular or zig-zag recesses or depressions. This configuration gives a pronounced increase both in traction and braking performance, in particular on snow.

All the embodiments described may also be combined with each other in dependence upon the demands made of the respective tyres, the achievable advantages mutually supplementing each other.

Claims

1. A vehicle tyre having a tread surface of ribs, blocks or pads and substantially U- or V-shaped tread grooves (1) arranged therebetween characterised in that at least one of the two sidewalls (2,3) of at least a part of the tread grooves (1) is provided with grip enhancing steps (4) which extend in the longitudinal groove direction and follow the sidewall contour.

2. A vehicle tyre in accordance with claim 1 characterised in that the steps (4) extend in a stair-like manner from the base of the groove (5) to the top edge of the sidewall (2, 3).

3. A vehicle tyre in accordance with claim 1 or claim 2 characterised in that at least those profile grooves which extend at an angle to the circumferential direction of the tyre are provided with steps (4).

4. A vehicle tyre in accordance with any of the preceding claims characterised in that the step height (x) and step width (y) of the steps lie in the range from 0.2 to 2mm.

5. A vehicle tyre in accordance with claim 4 characterised in that the step height (x) lies in the range of 0.5 to 2mm.

6. A vehicle tyre in accordance with claim 4 characterised in that the step width lies in the range of 0.2 to 1mm.

7. A vehicle tyre in accordance with any of the

preceding claims characterised in that the angle (α) enclosed by the stair surfaces lies in the range of 10 to 90°

8. A vehicl tyre in accordance with any f th preceding claims charact rised in that the angle (α) enclosed by the stair surfaces lies in the range of 15 to 75°.

9. A vehicle tyre in accordance with any of the preceding claims characterised in that at least a part of the ribs, blocks or pads (6) is provided with knife cuts (7) which are substantially transverse to or at least at an angle to the circumferential direction of the tyre and the tread surface region (8) between two sequential knife cuts (7) has a chamfered shape leaving free an edge (9) of the lamella formed by the knife cut (7), at least adjacent to the trailing or leading knife cut (7).

10. A vehicle tyre in accordance with claim 9 characterised in that the entire surface region (8) disposed between two knife cuts (7) is shaped so that it drops away at an inclined angle to the running direction.

11. A vehicle tyre in accordance with claim 10 characterised in that the tread inclination angle (β) between two knife cuts (7) is 10 to 30°.

12. A vehicle tyre in accordance with claim 9 characterised in that the surface region disposed between two sequential knife cuts (7) is chamfered only adjacent the trailing knife cut (7).

13. A vehicle tyre in accordance with claim 12 characterised in that the angle of inclination (β) is 50° to 70°.

14. A vehicle tyre in accordance with any of the preceding claims characterised in that the blocks or pads (6) have a surface (12) which drops away oppositely to the running direction (L) and at least adjacent the subsequent edge (11) , in particular in the tyre shoulder region.

15. A vehicle tyre in accordance with claim 14 characterised in that the surface between the leading edge (10) and the trailing edge (11) first rises and then drops away in the last third, with the rise angle ($\gamma 1$) being smaller than the droop angle ($\gamma 2$).

16. A vehicle tyre in accordance with claim 15 characterised in that the transition between the rising region (13) and the drooping region (12) is of curved shape.

17. A vehicle tyre in accordance with any of the preceding claims characterised in that the leading edge (10) is formed as a spoiler-like protuberance (14).

18. A vehicle tyre in accordance with one or more of the preceding claims characterised in that a part of the obliquely shaped tread surface regi ns disposed between two knife cuts (7) or tread grooves (1) are inclined oppositely to the direction of running (L) and a further part is inclined so as to drop away in the direction of running (L).

19. A vhicle tyre in accordance with any of the preceding claims characterised in that the side surfaces of the blocks or pads (6) ar provided ov r at l ast a part of their height with adjacent depressions (15) which ext nd in the height direction.

20. A vehicle tyre in accordance with claim 19 characterised in that the depressions (15) are of semi-circular shape.

21. A vehicle tyre in accordance with claim 19 characterised in that the recesses (15) have a zigzag shape.

FIG.1

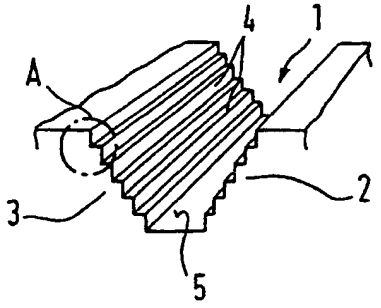

FIG.2

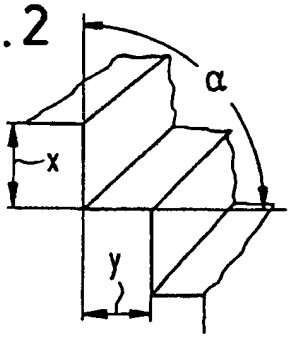

FIG.3

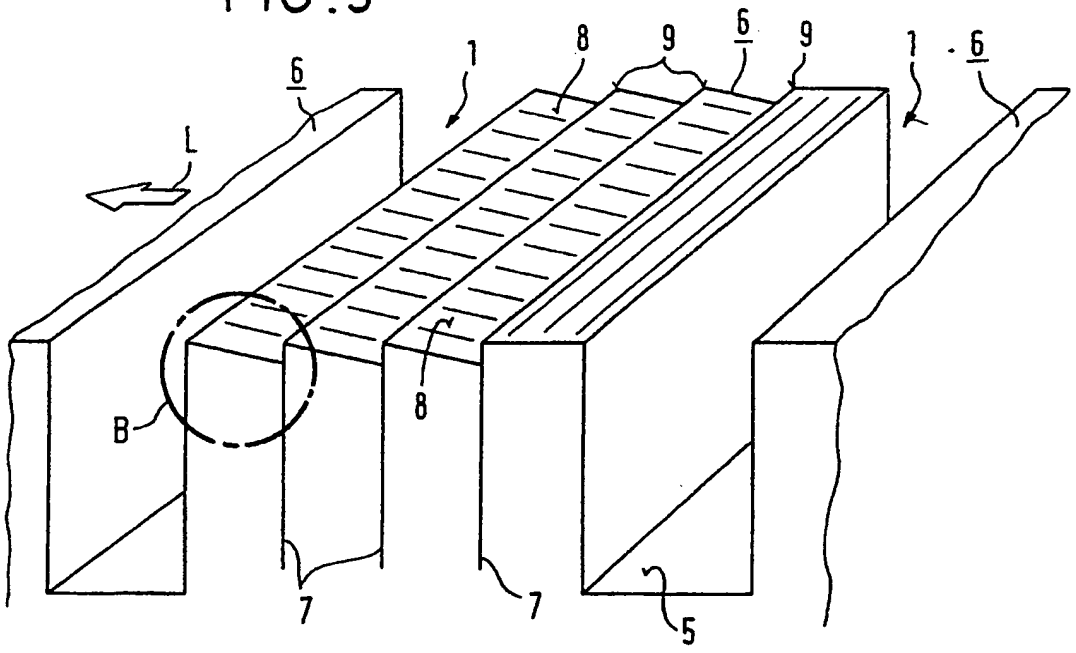

FIG.4

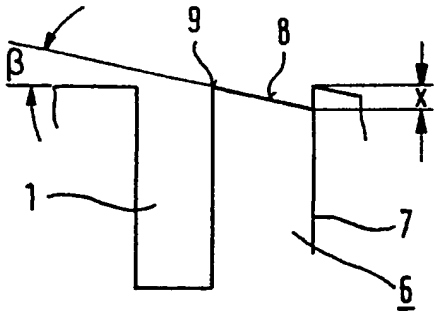

FIG.5

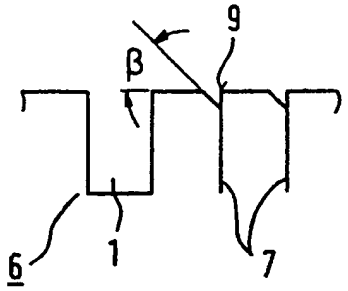

FIG.6

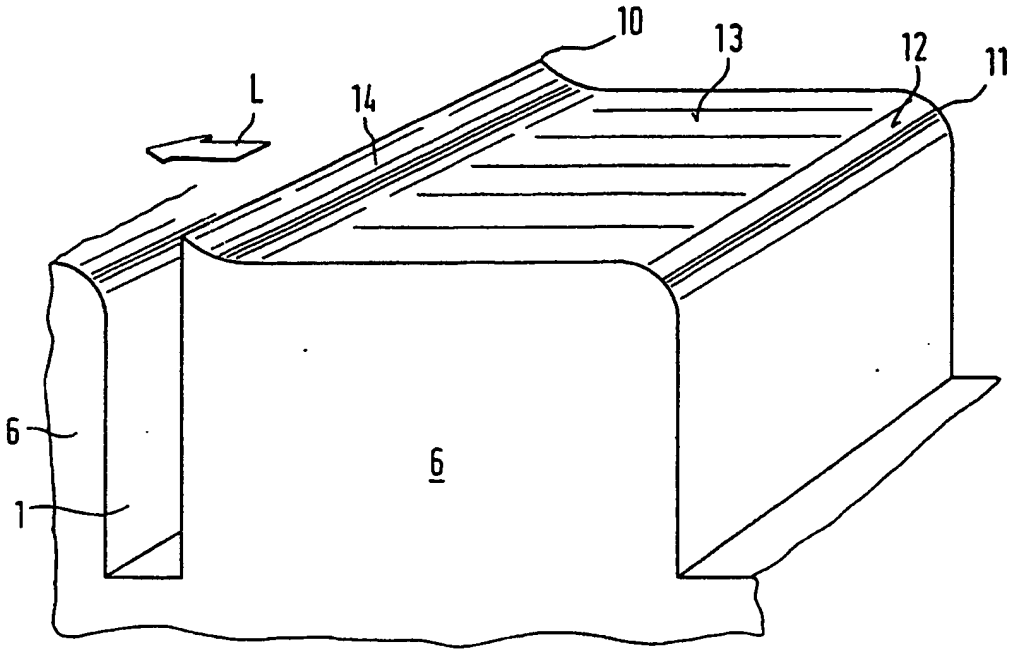

FIG.7

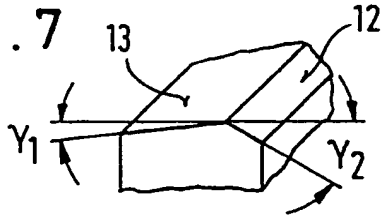

FIG.8